

1 **WHAT IS CLAIMED IS:**

2 1. A method of joining a first metal to a surface of a
3 second metal at a region susceptible to stress corrosion cracking,
4 comprising welding said first metal to said surface of said second
5 metal under conditions of low heat input to achieve reduced
6 thermal sensitization.

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8 2. A method according to claim 1 wherein said first
9 metal is cladding and said second metal is a component of a
10 nuclear reactor.

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12 3. A method according to claim 2 wherein said welding
13 is effected using a welding torch.

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15 4. A method according to claim 3 wherein said welding
16 torch travels at a speed in excess of 10 inches per minute.

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18 5. A method according to claim 3 wherein said welding
19 torch travels at a speed of 15 to 30 inches per minute.

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21 6. A method according to claim 1 wherein said heat
22 input is less than 1.5 kJoules per cm.

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24 7. A method according to claim 6 wherein said heat
25 input is in the range of 0.5 to 1.0 kJoules per cm.

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27 8. A method according to claim 1 wherein said welding
28 is carried out using a filler material.

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30 9. A method according to claim 8 wherein said filler
31 material comprises a noble metal.

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33 10. A method according to claim 9 wherein said noble
34 metal is selected from the group consisting of palladium,
35 platinum, rhodium and combinations thereof.

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37 11. A method according to claim 9 wherein said noble
38 metal is present in said filler material in an amount of 1% by
39 weight or less.

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41 12. A method according to claim 9 wherein said noble
42 metal is present in said filler material an amount of about 0.25 to
43 0.75 % by weight.

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45 13. A method according to claim 1 wherein said welding
46 is carried out over a period of time such that such that the metal
47 temperature during weld cooling is insufficient to allow carbide
48 formation on grain boundaries.

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50 14. A method according to claim 1 wherein said welding
51 is carried out over a period of time in the sensitizing range such
52 that such that the metal temperature during weld cooling is
53 insufficient to allow carbide formation on grain boundaries.

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55 15. A method according to claim 1 wherein said welding
56 is carried out over a period of time to form a fine microstructure of
57 Delta Ferrite.

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59 16. A method of joining a first metal to a surface of a
60 second metal at a region susceptible to stress corrosion cracking,
61 comprising welding said first metal to said second metal under
62 conditions of low heat input to achieve reduced residual stress on
63 said surface and near surface.

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65 17. A method according to claim 13, wherein said first
66 metal has a far surface which is water cooled.

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68 18. A method according to claim 13, wherein said first
69 metal has a far surface which is air cooled.

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71 19. A method according to claim 13, wherein said first
72 metal has a far surface which exhibits reduced residual stress.

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74 20. A method according to claim 13, wherein said first
75 metal has a near surface which exhibits reduced residual stress.

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77 21. A method according to claim 13, wherein said first
78 metal is adjacent to a near surface of said second metal.

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80 22. A method according to claim 13, wherein said second
81 metal is adjacent to a near surface of said first metal.